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EXAMINER

VAUTROT, DENNIS L

ART UNIT PAPER NUMBER

2167

DATE MAILED: 10/16/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/671,297

Applicant(s)

VERMA ET AL.

Examiner

Dennis L. Vautrot

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 August 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 4, 5, 10 - 12, 14, 16, 17, & 19 is/are rejected.
- 7) ☒ Claim(s) 2, 3, 6-9, 13, 15, 18, & 20 - 24 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a). Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The applicants' amendment, filed 8 August 2006, has been received, entered into the record and considered.
2. As a result of the amendment, claims 1 – 3, 6, 10 – 13 have been amended and claims 14 – 24 have been added. Claims 1 – 24 are pending in the application.

Response to Arguments

3. Applicant's arguments with respect to claims 1 - 13 have been considered but are moot in view of the new ground(s) of rejection.

Drawings

4. The drawings are objected to because in Figure 7, Rnei is not referred to in the specification. It is assumed the applicant meant to put Snei. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief

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description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

5. The disclosure is objected to because of the following informalities: On page 8, lines 21- 22, "Xw" is referred to, when it should be "Xn" to be consistent with the rest of the disclosure.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1, 10 – 12, 14, 16 – 17 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by **Mohan** (US 6,009,425).

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8. Regarding claim 1, **Mohan** teaches a database management system, comprising: a processor configured to provide a neighborhood locking scheme for a neighborhood of free space adjacent to and associated with a data item and extending to an adjacent data item (See column 7, lines 1 – 3 “With index-specific locking, a lock on a key is made to be different from the lock on the corresponding piece of data that contains the key.” And see column 7, lines 14 – 19 “In order to guarantee serializability whenever a key is deleted... an exclusive (X) lock for commit duration... is obtained on the next higher key that currently exists in the index.”), the neighborhood locking scheme concurrently creating both a first locking mode for the data item [data lock], while at the same time creating a second locking mode for the neighborhood [key lock] associated with the data item; (See column 15, lines 9 – 11 “With index-specific locking the query processing component RDS 84 specifies one mode for the key lock and, if necessary, a separate mode for the data lock.”);

where the first locking mode when first held on the data item determines an associated set of predetermined access restrictions for the data item and determines an associated different set of predetermined access restrictions for the neighborhood associated with the data item (See column 7, lines 25 – 30 “If such a read transaction is still executing, the inserter’s next key locking delays the insert since a reader obtains a shared (S) lock for commit duration on the next key if the reader does not find the key that it is looking for (S is compatible with S, but is incompatible with X).” Here, the lock held on the data item (S) from the read determines the access restrictions for that item

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as well as controls the access for the “next key lock” or neighborhood lock based on the lock, which is different access restrictions from the neighborhood.); and

where the second locking mode when first held on the neighborhood [next key lock] determines the associated set of predetermined access restrictions for the neighborhood and determines the associated different set of predetermined access restrictions for the data item. (See column 7, lines 22 – 29 “In similar fashion, a next key lock is acquired momentarily (instant duration) on the next key during the insert of a key to make sure that the insert is not going to interfere with a reader who has already searched for (and not found) the key being inserted. If such a read transaction is still executing, the inserter’s next key locking delays the insert since a reader obtains a shared (S) lock for commit duration on the next key if the reader does not find the key that it is looking for...” Here, the neighborhood [next key] lock determines access restrictions for the neighborhood, but is also what is determining the access restrictions (i.e. delays the insert) for the data item.)

9. Regarding claim 10, **Mohan** teaches a method for controlling access to data items in a database, comprising: identifying a neighborhood of free space adjacent to a data item in the database (See column 7, lines 14 – 19 “In order to guarantee serializability whenever a key is deleted... an exclusive (X) lock for commit duration... is obtained on the next higher key that currently exists in the index.” This locks the free space adjacent to the key or “data item”, therefore it is identified.);

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providing a first set of access privileges to a first transaction [reader obtains an (S) lock] accessing the data item and holding a lock mode on the data item corresponding with the first transaction. (See column 7, lines 25 – 30 “If such a read transaction is still executing, the inserter’s next key locking delays the insert since a reader obtains a shared (S) lock for commit duration on the next key if the reader does not find the key that it is looking for (S is compatible with S, but is incompatible with X).” Here, the first transaction is the read, and the lock held on the data item (S) from the read determines the access restrictions for that item.); and

providing a second set of access privileges to a second transaction operating independently of the first transaction and accessing the neighborhood associated with the data item, the second set of access privileges determined by the lock mode already held on the data item by the first transaction. (See column 7, lines 22 – 29 “In similar fashion, a next key lock is acquired momentarily (instant duration) on the next key during the insert of a key to make sure that the insert is not going to interfere with a reader who has already searched for (and not found) the key being inserted. If such a read transaction is still executing, the inserter’s next key locking delays the insert since a reader obtains a shared (S) lock for commit duration on the next key if the reader does not find the key that it is looking for...” This is a second transaction testing to see what lock is already held on the data item, caused by the first transaction. Here, the neighborhood [next key] lock determines access restrictions for the neighborhood, but is also what is determining the access restrictions (i.e. delays the insert) for the data item.)

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10. Regarding claim 11, **Mohan** teaches using a lock mode first held on the data item for determining the first set of access privileges for the data item and the second set of access privileges for the neighborhood (See column 7, lines 25 – 30 “If such a read transaction is still executing, the inserter’s next key locking delays the insert since a reader obtains a shared (S) lock for commit duration on the next key if the reader does not find the key that it is looking for (S is compatible with S, but is incompatible with X).” Here, the lock held on the data item (S) from the read determines the access restrictions for that item as well as controls the access for the “next key lock” or neighborhood lock based on the lock, which is different access restrictions from the neighborhood.); and

Using the lock mode first held on the neighborhood for determining the first set of access privileges for the data item and the second set of access privileges for the neighborhood. (See column 7, lines 22 – 29 “In similar fashion, a next key lock is acquired momentarily (instant duration) on the next key during the insert of a key to make sure that the insert is not going to interfere with a reader who has already searched for (and not found) the key being inserted. If such a read transaction is still executing, the inserter’s next key locking delays the insert since a reader obtains a shared (S) lock for commit duration on the next key if the reader does not find the key that it is looking for...” Here, the neighborhood [next key] lock determines access restrictions for the neighborhood, but is also what is determining the access restrictions (i.e. delays the insert) for the data item.)

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11. Regarding claim 12, **Mohan** teaches preventing the first transaction from locking the data item when the second independent transaction already holds a lock on the neighborhood. (See column 7, lines 15 – 20 “In order to guarantee serializability whenever a key is deleted (due to record deletion or a record update which causes the key value to change), an exclusive (X) lock for commit duration (i.e., for the duration of the transaction) is obtained on the next higher key that exists in the index.” Here, the neighborhood is locked with an X lock, which would prevent any other transaction from locking the data item.)

12. Regarding claim 14, **Mohan** teaches using entries in an index to identify the neighborhood. (See column 1, lines 8 – 11 “Still more particularly, the invention concerns a database storage system in which the data (e.g., records in a file) are stored separately from searchable index files corresponding to the data.” And see column 7, lines 15 – 22 “In order to guarantee serializability whenever key is deleted..., an exclusive (X) lock for commit duration (i.e., for the duration of the transaction) is obtained on the next higher key that currently exists in the index. It is this next key that blocks subsequent readers who look for the delete key until the deleting transaction terminates.” The neighborhood is made up of the space between the tuple and the next key that is locked in the index as described.)

13. Regarding claim 16, **Mohan** teaches a system for controlling access to data items in a database, comprising: means for identifying a neighborhood of free space

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adjacent to a data item in the database (See column 7, lines 14 – 19 “In order to guarantee serializability whenever a key is deleted... an exclusive (X) lock for commit duration... is obtained on the next higher key that currently exists in the index.” This locks the free space adjacent to the key or “data item”, therefore it is identified.);

means for providing a first set of access privileges for the data item according to a lock mode held on the data item; (See column 7, lines 25 – 30 “If such a read transaction is still executing, the inserter’s next key locking delays the insert since a reader obtains a shared (S) lock for commit duration on the next key if the reader does not find the key that it is looking for (S is compatible with S, but is incompatible with X).” Here, the first transaction is the read, and the lock held on the data item (S) from the read determines the access restrictions for that item.); and

means for providing a second set of access privileges for the neighborhood associated with the data item and determined by the lock mode held on the data item; (See column 7, lines 22 – 29 “In similar fashion, a next key lock is acquired momentarily (instant duration) on the next key during the insert of a key to make sure that the insert is not going to interfere with a reader who has already searched for (and not found) the key being inserted. If such a read transaction is still executing, the inserter’s next key locking delays the insert since a reader obtains a shared (S) lock for commit duration on the next key if the reader does not find the key that it is looking for...” This is a second transaction testing to see what lock is already held on the data item, caused by the first transaction. Here, the neighborhood [next key] lock determines access restrictions for

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the neighborhood, but is also what is determining the access restrictions (i.e. delays the insert) for the data item.);

means for using a lock mode first held on the data item for determining the first set of access privileges for the data item and the second set of access privileges for the neighborhood (See column 7, lines 25 – 30 “If such a read transaction is still executing, the inserter’s next key locking delays the insert since a reader obtains a shared (S) lock for commit duration on the next key if the reader does not find the key that it is looking for (S is compatible with S, but is incompatible with X).” Here, the lock held on the data item (S) from the read determines the access restrictions for that item as well as controls the access for the “next key lock” or neighborhood lock based on the lock, which is different access restrictions from the neighborhood.); and

means for using the lock mode first held on the neighborhood for determining the first set of access privileges for the data item and the second set of access privileges for the neighborhood. (See column 7, lines 22 – 29 “In similar fashion, a next key lock is acquired momentarily (instant duration) on the next key during the insert of a key to make sure that the insert is not going to interfere with a reader who has already searched for (and not found) the key being inserted. If such a read transaction is still executing, the inserter’s next key locking delays the insert since a reader obtains a shared (S) lock for commit duration on the next key if the reader does not find the key that it is looking for...” Here, the neighborhood [next key] lock determines access restrictions for the neighborhood, but is also what is determining the access restrictions (i.e. delays the insert) for the data item.)

14. Regarding claim 17, **Mohan** teaches means for preventing a first transaction from locking the data item when the second independent transaction already holds a lock on the neighborhood. (See column 7, lines 15 – 20 “In order to guarantee serializability whenever a key is deleted (due to record deletion or a record update which causes the key value to change), an exclusive (X) lock for commit duration (i.e., for the duration of the transaction) is obtained on the next higher key that exists in the index.” Here, the neighborhood is locked with an X lock, which would prevent any other transaction from locking the data item.)

15. Regarding claim 19, **Mohan** teaches a computer readable medium containing instructions that when executed by a computer comprise:

providing a neighborhood locking scheme for a neighborhood of free space adjacent to and associated with a data item and extending to an adjacent data item (See column 7, lines 1 – 3 “With index-specific locking, a lock on a key is made to be different from the lock on the corresponding piece of data that contains the key.” And see column 7, lines 14 – 19 “In order to guarantee serializability whenever a key is deleted... an exclusive (X) lock for commit duration... is obtained on the next higher key that currently exists in the index.”), the neighborhood locking scheme concurrently creating both a first locking mode for the data item [data lock], while at the same time creating a second locking mode for the neighborhood [key lock] associated with the data item; (See column 15, lines 9 – 11 “With index-specific locking the query

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processing component RDS 84 specifies one mode for the key lock and, if necessary, a separate mode for the data lock.");

causing the first locking mode when first held on the data item determines an associated set of predetermined access restrictions for the data item and determines an associated different set of predetermined access restrictions for the neighborhood associated with the data item (See column 7, lines 25 – 30 "If such a read transaction is still executing, the inserter's next key locking delays the insert since a reader obtains a shared (S) lock for commit duration on the next key if the reader does not find the key that it is looking for (S is compatible with S, but is incompatible with X)." Here, the lock held on the data item (S) from the read determines the access restrictions for that item as well as controls the access for the "next key lock" or neighborhood lock based on the lock, which is different access restrictions from the neighborhood.); and

causing the second locking mode when first held on the neighborhood [next key lock] determines the associated set of predetermined access restrictions for the neighborhood and determines the associated different set of predetermined access restrictions for the data item. (See column 7, lines 22 – 29 "In similar fashion, a next key lock is acquired momentarily (instant duration) on the next key during the insert of a key to make sure that the insert is not going to interfere with a reader who has already searched for (and not found) the key being inserted. If such a read transaction is still executing, the inserter's next key locking delays the insert since a reader obtains a shared (S) lock for commit duration on the next key if the reader does not find the key that it is looking for..." Here, the neighborhood [next key] lock determines access

restrictions for the neighborhood, but is also what is determining the access restrictions (i.e. delays the insert) for the data item.)

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

17. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Mohan** as applied to claim 1 above, and further in view of **C. Mohan**, "ARIES/KVL: A Key-Value Locking Method for Concurrency Control of Multiaction Transactions Operating on B-Tree Indexes", Proceedings of the 16th VLDB Conference, Brisbane, Australia, August 1990. (hereinafter **C. Mohan**). **Mohan** teaches a database management system substantially as claimed. **Mohan** does not explicitly state that the neighborhood corresponds to free space between tuples in a table. However **C. Mohan** discloses that the neighborhood corresponds to free space [gap] between tuples [F,G] in a table. (See page 396, column 2, 3rd paragraph, "Somehow, the fetching transaction needs to communicate, to inserting transactions, the fact that no new key should be inserted in the gap (i.e., between 'F' and 'G')." In other words the gap between the tuples is considered the neighborhood.) It would have been obvious to one with ordinary skill in the art at the time of the invention to combine the teachings of **Mohan** with that of **C.**

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Mohan because the patent of **Mohan** is filed based on the previously written document **C. Mohan** by the same author and is referred to in the patent as a reference.

Additionally, both of the references are referring to concurrency control of operations between transactions and by including the "free space" teachings of **C. Mohan**, it further clarifies the concept of the neighborhood or "range" that is referred to in **Mohan**. It is for this reason that one of ordinary skill in the art would have been motivated to include the neighborhood corresponds to free space between tuples in a table.

18. Regarding claim 5, the combination of **Mohan** and **C. Mohan** additionally discloses the tuples in the table are identified through an index. (See **Mohan**, column 1, lines 8 – 11 "Still more particularly, the invention concerns a database storage system in which the data (e.g., records in a file) are stored separately from searchable index files corresponding to the data.")

Allowable Subject Matter

19. Claims 2, 3, 6-9, 13, 15, 18, and 20 – 24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The above claims are related to the newly created locks on the neighborhoods which were not able to be located in prior art.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.


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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dennis L. Vautrot whose telephone number is 571-272-2184. The examiner can normally be reached on Monday-Friday 8:30-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Cottingham can be reached on 571-272-7079. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Dv
10 October 2006


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SUPERVISORY PATENT EXAMINER
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12 October 2006